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Indian Standard

METHOD FOR DETERMINATION OF BARIUM ACTIVITY NUMBER OF COTTON TEXTILE MATERIALS

(First Revision)

UDC 677·21·06 : 677 014·23 [546 431-36]

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110001

March 1974

AMENDMENT NO. 1 DECEMBER 1982

TO

IS:1689-1973 METHOD FOR DETERMINATION OF BARIUM ACTIVITY NUMBER OF COTTON TEXTILE MATERIALS

(First Revision)

Alteration

(Page 3, clause 0.3) - Substitute the following for the existing clause:

'0.3 Apart from lustre the absorption capacity of cotton is greatly increased by mercerization. Mercerized cotton absorbs soluble alkaline hydroxides to a greater extent than unmercerized cotton. Barium hydroxide is more readily absorbed by cotton cellulose than other alkalis and its absorption is convenient to measure. This barium hydroxide absorption test thus indicative of the cotton material having undergone the process of mercerization. If unmercerized cotton is indicated by Barium Activity Number 100, the Barium Activity Number above 115 indicates that the sample under test has undergone the process of mercerization. This test can not be used satisfactorily on materials treated with durable finishes, or dyed with sulphuric dyes or if fibres other than cotton are present.'

(TDC 5)

Reprography Unit, ISI, New Delhi, India

Indian Standard

METHOD FOR DETERMINATION OF BARIUM ACTIVITY NUMBER OF COTTON TEXTILE MATERIALS

(First Revision)

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(*Continued on page* 2)

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Indian Standard

METHOD FOR DETERMINATION OF BARIUM ACTIVITY NUMBER OF COTTON TEXTILE MATERIALS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 31 October 1973, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 This standard was first published in 1960. It is being revised to make it up to date on the basis of the experience gained during its use. The details of the procedure for desizing by enzymatic treatment have also been included.

0.3 Apart from lustre, the absorptive property of cotton is greatly increased by mercerization. Mercerized cotton absorbs soluble alkaline hydroxides to a greater extent than unmercerized cotton. Barium hydroxide is more readily absorbed than other alkalis and its absorption is easier to measure. The barium hydroxide absorption test is one of the useful tests for identification of mercerized cotton and for determining the extent to which cotton is swollen. The test has the advantage that it can be applied to dyed as well as undyed cotton materials. The method is also intended for determining the degree of mercerization in cotton materials. If unmercerized cotton is indicated by barium activity number 100, mercerized yarns and fabrics usually give numbers from 100 to 165.

0.4 In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes a method for determination of barium activity number of cotton materials.

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*Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definition shall apply.

2.1 Barium Activity Number — The ratio of the quantity of barium hydroxide absorbed by mercerized cotton to that absorbed by unmercerized cotton under identical conditions, multiplied by 100.

3. PRINCIPLE

3.1 A sample is taken and completely freed from all sizing and finishing materials. It is treated with barium hydroxide to determine its absorption. The absorption of an unmercerized cotton sample is also determined under identical conditions. The ratio of absorption of test sample and unmercerized cotton sample is expressed as the barium activity number taking the unmercerized cotton as 100.

4. SAMPLING

4.1 Samples shall be selected so as to be representative of the lot.

4.2 Sample drawn as laid down in the material specification or in compliance with an agreement between the buyer and the seller shall be held to be representative of the lot.

4.3 In case of cotton fabrics, the sample shall be drawn in accordance with the procedure given in IS : 5463-1969*.

5. TEST SPECIMENS AND CONTROL SPECIMEN

5.1 Test Specimens

5.1.1 If the sample under test is yarn, draw from it at least three specimens each weighing about 3 g.

5.1.2 If the sample under test is fabric, draw from it three specimens each weighing about 3 g and preferably square in shape.

5.2 Control Specimen — Draw from the basic (unmercerized, scoured) cotton material a specimen weighing about 3 g.

NOTE — If the basic (unmercerized) material is not available, an unmercerized (scoured) cotton material similar in construction to that under test shall be used for the control.

6. APPARATUS

6.1 Soxhlet Extractor

6.2 Drying-Oven — Capable of being maintained at a temperature of 105 ± 3°C.

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*Methods for sampling of cotton fabrics for chemical tests.

6.3 Conical Flask — with stopper.

6.4 Pipette

7. REAGENTS

7.1 Unless specified otherwise pure chemicals shall be applied in the test. Distilled water (*see* IS : 1070-1960*) shall be used where the use of water as a regent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of the analysis.

7.2 Chloroform

7.3 Diastase or Other Suitable Desizing Enzyme

7.4 Sodium Chloride

7.5 Soap-Soda Solution — containing 20 g of soap and 10 g of anhydrous sodium carbonate per litre. The soap shall contain not more than 5 percent moisture and shall comply with the following composition, dry mass basis:

Free alkali (as Na_2CO_3), *Max*	0·3 percent
Free alkali (as NaOH), *Max*	0·1 percent
Combined fatty acids (as sodium salt), *Min*	85 percent
Titre of mixed fatty acids prepared from the soap, *Max*	30°C
Iodine value of fatty acids, *Max*	50

7.6 Barium Hydroxide Solution — approximately 0·25 N.

7.7 Hydrochloric Acid — 0·05 N and 0·1 N.

7.8 Phenolphthalein Indicator — prepared by dissolving 0·5 g of phenolphthalein in 50 ml of ethyl alcohol and diluting to 100 ml with water.

8. PROCEDURE

8.1 Take one test specimen.

8.1.1 If the material under test is not heavily finished, desize the specimen as given in **8.1.1.1**, **8.1.1.2** or **8.1.1.3** depending on the type of ingredients used in the size or finish.

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*Specification for water, distilled quality (*revised*).

8.1.1.1 In case it is known that the material is sized or finished with a mixing containing starch but not tamarind kernel powder, dip the specimen in a solution (weighing 20 times the mass of the specimen) containing 5 g of diastase and 10 g of sodium chloride per litre at 70°C and at a *p*H of 6·5 to 7·7 (*see* Note). Allow the specimen to remain in the solution for one and a half hours. During this period, take it out from the desizing bath and wring it by hand at least three times. At the end of the period remove the specimen, wash it thoroughly four times in hot and cold water successively, using 50 ml of water for each wash.

NOTE — The temperature and *p*H given for the desizing solution are the optimum for bacterial diastase. If any other type of desizing enzyme is used, then the temperature and *p*H shall be modified to that recommended by the supplier. As many enzymatic desizing agents slowly deteriorate in storage, care shall be taken to see that the sample of desizing agent, at the time of test, has still satisfactory desizing efficiency.

If any doubt exists as to whether the size or finish has been completely removed, the treatment with the enzymatic desizing solution shall be repeated, the specimen being again weighed after drying to constant mass at 105 to 110°C and the ,percentage loss in mass again calculated. If the value for the percentage loss in mass has increased by not more than 0·25, then it may be considered that complete desizing has been effected, and the second value be accepted as the final value. If the value for the percentage loss in mass has increased by more than 0·25, then the desizing treatment should be repeated until the figure for percentage loss in mass does not differ from the previous figure by more than 0·25.

8.1.1.2 In case it is known that the material is sized or finished with a mixing containing tamarind kernel powder but not starch, boil the specimen in the soap-soda solution (weighing 20 times the mass of the specimen) for 45 minutes. Wash it thoroughly first in hot water and then in cold water.

8.1.1.3 In case it is known that the material is sized or finished with a mixing containing both starch and tamarind kernel powder or in case the ingredients used in the size or finish are not known, desize the specimen in the manner prescribed in **8.1.1.1** for the specimen known to contain starch and treat it further in the manner prescribed in **8.1.1.2** for the specimen known to contain tamarind kernel powder.

8.1.2 If the material under test is heavily finished with mineral oils and waxes or with salts, extract the specimen with chloroform in a Soxhlet extracting apparatus for one hour, and then desize the specimen as given in **8.1.1**.

8.1.3 Add bromocresol purple to the water extract of the sample and add dilute hydrochloric acid (0·05 N to 0·1 N) drop by drop till it turns yellow. Keep the solution for about 30 minutes. Remove the extract. Wash the sample with distilled water till it is free from acid.

8.2 Dry the specimen and expose it to room atmosphere for about 4 hours. Cut the specimen into small pieces. Take exactly 2 g (on oven-dry basis) of the specimen.

NOTE — For calculating the mass of mercerized and unmercerized cotton to be taken for the test, the values of actual regain used are as given below:

Mercerized cotton	9 percent
Unmercerized cotton	6 percent

8.3 Transfer the specimen to a 50-ml conical flask and add 30 ml of barium hydroxide solution to it. Stopper the flask and allow it to stand for at least 2 hours, with frequent shaking. At the end of this period, pipette out 10 ml of the clear solution from the flask and titrate it with hydrochloric acid using phenolphthalein as indicator.

8.4 Make a blank determination following the same procedure (*see* **8.3**) but without the test specimen.

8.5 Treat the control specimen in a similar manner (*see* **8.1** to **8.3**) along with the test specimen.

8.6 Similarly test other test specimens.

9. CALCULATIONS

9.1 Calculate the barium activity number by the following formula:

$$\text{Barium activity number} = \frac{a - b}{a - c} \times 100$$

where

a = quantity, in ml, of hydrochloric acid required for the blank (*see* **8.4**);

b = quantity in ml, of hydrochloric acid required for the test specimen (*see* **8.3**); and

c = quantity, in ml, of hydrochloric acid required for the control specimen (*see* **8.5**).

9.2 Calculate the barium activity number of other test specimens and determine the average of all values obtained.

10. REPORT

10.1 The report shall include the following information:

a) Type of material tested,

b) Number of test specimens, and

c) Barium activity number.

INDIAN STANDARDS ON CHEMICAL METHODS OF TEST FOR TEXTILES

IS:	
199-1973	Methods for estimation of moisture, total size or finish, ash and fatty matter in grey and finished cotton textile materials (*second revision*)
200-1969	Method for determination of copper number of cotton textile materials (*first revision*)
244-1969	Method for determination of viscosity (or fluidity) of solutions of cotton and regenerated cellulose in cuprammonium hydroxide (*first revision*)
389-1973	Methods for estimation of small quantities of sulphuric acid and hydrochloric acid in cotton materials (*first revision*)
1039-1956	Methods for estimation of small quantities of copper, iron, manganese, chromium and zinc in proofed cotton fabrics (*tentative*)
1185-1957	Method for determining the relative wetting power of wetting agents (*tentative*)
1349-1964	Methods for determination of wool fibre content of raw wool (*revised*)
1383-1960	Method for determination of scouring loss in grey and finished cotton textile materials
1390-1961	Methods for determination of *p*H value of aqueous extracts of textile materials
1560-1962	Method for estimation of carboxylic acid groups in cellulosic textile materials
1582-1968	Method for determination of scouring loss in silk textile materials
1689-1973	Method for determination of barium activity number of cotton textile materials (*first revision*)
1967-1961	Method for estimation of residual starch in cotton fabrics after desizing
2350-1963	Method for estimation of residual chlorine in cotton textile materials
2369-1967	Method for determination of absorbency of absorbent textile materials (*first revision*)
2969-1964	Method for determination of added oil content of jute yarn and fabrics
3429-1966	Method for determination of solubility of wool in alkali
3430-1966	Method for determination of solubility of wool in urea-bisulphite solution
3456-1966	Method for determination of water soluble matter of textile materials
4202-1967	Method for determination of chloride content of textile materials
4203-1967	Method for determination of sulphate content in textile materials
4390-1967	Method for determination of ether-soluble matter in textile materials
5151-1969	Method for evaluating the relative efficiency of wetting agents for mercerization
5152-1969	Method for determination of benzene-methyl alcohol soluble matter in textile materials
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